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EXAMINER	
DOTY, HEATHER ANNE	

ART UNIT	PAPER NUMBER
2813	

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Please find below and/or attached an Office communication concerning this application or proceeding.

H:A

Office Action Summary	Application No.	Applicant(s)	
	10/665,267	GEORGE ET AL.	
	Examiner	Art Unit	
	Heather A. Doty	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6-23 and 25-82* is/are pending in the application.

4a) Of the above claim(s) *37-66,69-74 and 77-80* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-10,13-23,25-29,32-36,67,68,75 and 76* is/are rejected.

7)☒ Claim(s) *11,12,30,31,81 and 82* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless – (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 6-9, 15, 16, 20-23, 25-28, 67, 68, 75, and 76 are rejected under 35 U.S.C. 102(b) as being anticipated by Fukuyama et al. (U.S. 5,770,100).

Regarding claim 1, Fukuyama et al. teaches a system (Fig. 2) for use in removing a process material from a treatment object, comprising a treatment chamber (**8** in Fig. 2) within which a plasma is generated using a hydrocarbon gas in combination with oxygen in a way which subjects the process material crust to the plasma for use in removal of the process material crust (column 5, lines 30-64; column 7, lines 7-25), said plasma being free of halogens, at least to an approximation (the treatment taught by Fukuyama et al. is designed to *remove* halogens from the treatment object, so halogens would not be present in the plasma; moreover, claim 7 of Fukuyama et al. expressly precludes the presence of halogens in the treatment plasma).

Fukuyama et al. additionally teaches that this plasma treatment is intended to remove an implant crust that is formed as an outmost layer of a photoresist pattern that is supported by a treatment object, said implant crust being formed responsive to exposure of the treatment object to an ion implant (the paragraph bridging columns 1 and 2 teaches that during the halogen plasma etch of the aluminum layer—part of the treatment object—halogens adhere on the surface of the resist and are implanted due

to the bombardment of ions) that introduces an implanted dopant into the treatment object (the paragraph bridging columns 1 and 2 additionally teaches that halogen components adhere to the sidewall of the etched wiring pattern) as well as into the photoresist (see above), thereby producing said implant crust. Fukuyama et al. does not expressly teach the implant dose of the ion bombardment causing the unwanted halogen doping, but claim 1 does not specify a dose, and since the ion bombardment taught by Fukuyama et al. is high enough to cause halogen components to implant in the resist, it is deemed a "high dose."

Furthermore, the phrase "at least for use in removing an implant crust that is formed as an outermost layer of a photoresist pattern that is supported by a treatment object, said implant crust being formed responsive to exposure of the treatment object to a high dose ion implant which introduces an implanted dopant into the treatment object as well as into the photoresist, thereby producing said implant crust" is an intended use of the plasma reactor system that does not limit the features of the system. Even if Fukuyama et al. did not teach this intended use of their system, their system is capable of generating a plasma using a hydrocarbon gas in combination with oxygen gas to subject an object to the plasma, said plasma being free of halogen, so claim 1 contains no structural limitation to distinguish the instant invention from the system taught by Fukuyama et al. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the

prior art structure is capable of performing the intended use, then it meets the claim (see MPEP 2111.02).

Regarding claims 2-4, Fukuyama et al. teaches the system of claim 1, and further teaches that the hydrocarbon gas produces low-molecular-weight radicals, including a molecular weight of less than approximately 30—further limited by claim 3—in the plasma, wherein the low-molecular-weight radicals include at least one of CH_2 and CH_3 radicals—further limited by claim 4 (methanol, CH_3OH—column 5, line 34; see also instant specification paragraph 28, which lists methanol as a process gas that will produce CH_2 or CH_3 radicals).

Regarding claims 6 and 7, Fukuyama et al. teaches the system of claim 5, and further teaches that the implant crust overlies an unaltered region of an original photoresist layer (column 1, lines 61-65) and said plasma formed using said hydrocarbon gas in combination with oxygen is used to remove said unaltered region of photoresist, and the process material crust and the unaltered region of the original photoresist layer are removed simultaneously (column 5, line 59 - column 6, line 8).

Regarding claim 8, Fukuyama et al. teaches the system of claim 7, and further teaches that the plasma is generated with downstream plasma generation means (Fig 2; column 5, lines 30-58).

Regarding claim 9, Fukuyama et al. teaches the system of claim 1 and further teaches that the treatment object is a semiconductor wafer (column 1, line 40; column 2, lines 49-52; **16** in Fig. 2).

Regarding claims 15 and 16, Fukuyama et al. teaches the system of claim 1 and

further teaches including a parallel-plate reactor (column 7, lines 48-50) or a microwave plasma source (column 4, lines 43-59) for generating said plasma.

Regarding claim 20, Fukuyama et al. teaches, in a plasma reactor system at least for use in removing a process material crust from a treatment object, a method comprising: generating a plasma in a treatment chamber using a hydrocarbon gas in combination with oxygen such that the plasma is halogen free (the treatment taught by Fukuyama et al. is designed to *remove* halogens from the treatment object, so halogens would not be present in the plasma), at least to an approximation, in a way which subjects the implant crust to the plasma for use in removal of the implant crust (column 5, lines 30-64; moreover, claim 7 of Fukuyama et al. expressly precludes the presence of halogens in the treatment plasma).

Fukuyama et al. additionally teaches that this plasma treatment is intended to remove an implant crust that is formed as an outmost layer of a photoresist pattern that is supported by a treatment object, said implant crust being formed responsive to exposure of the treatment object to an ion implant (the paragraph bridging columns 1 and 2 teaches that during the halogen plasma etch of the aluminum layer—part of the treatment object—halogens adhere on the surface of the resist and are implanted due to the bombardment of ions) that introduces an implanted dopant into the treatment object (the paragraph bridging columns 1 and 2 additionally teaches that halogen components adhere to the sidewall of the etched wiring pattern) as well as into the photoresist (see above), thereby producing said implant crust. Fukuyama et al. does not expressly teach the implant dose of the ion bombardment causing the unwanted

halogen doping, but claim 1 does not specify a dose, and since the ion bombardment taught by Fukuyama et al. is high enough to cause halogen components to implant in the resist, it is deemed a "high dose."

Furthermore, the phrase "at least for use in removing an implant crust that is formed as an outermost layer of a photoresist pattern that is supported by a treatment object, said implant crust being formed responsive to exposure of the treatment object to a high dose ion implant which introduces an implanted dopant into the treatment object as well as into the photoresist, thereby producing said implant crust" is an intended use of the plasma reactor system that does not limit the features of the system. Even if Fukuyama et al. did not teach this intended use of their system, their system is capable of generating a plasma using a hydrocarbon gas in combination with oxygen gas to subject an object to the plasma, said plasma being free of halogen, so claim 1 contains no structural limitation to distinguish the instant invention from the system taught by Fukuyama et al. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (see MPEP 2111.02).

Regarding claims 21-23, Fukuyama et al. teaches the method of claim 20, and further teaches that the hydrocarbon gas produces low-molecular-weight radicals, including a molecular weight of less than approximately 30—further limited by claim 22—in the plasma, wherein the low-molecular-weight radicals include at least one of

CH_2 and CH_3 radicals—further limited by claim 23 (methanol, CH_3OH—column 5, line 34; see also instant specification paragraph 28, which lists methanol as a process gas that will produce CH_2 or CH_3 radicals).

Regarding claims 25 and 26, Fukuyama et al. teaches the method of claim 24, and further teaches that implant crust overlies an unaltered region of said original photoresist layer (column 1, lines 61-65) and the method includes using said plasma to remove said unaltered region of photoresist, and the implant crust and the unaltered region of the original photoresist layer are removed simultaneously (column 5, line 59 - column 6, line 8).

Regarding claim 27, Fukuyama et al. teaches the method of claim 26, and further teaches downstream generation of said plasma (Fig. 2; column 5, lines 30-58).

Regarding claim 28, Fukuyama et al. teaches the method of claim 20, and further teaches that the treatment object is a semiconductor wafer (column 1, line 40; column 2, lines 49-52; **16** in Fig. 2).

Regarding claim 67, Fukuyama et al. teaches a plasma reactor system at least for use in removing an implant crust from a treatment object, said system comprising a treatment chamber within which a halogen-free plasma (Fukuyama et al., claim 7) is generated using a gas in combination with oxygen gas in a way which produces at least one of CH_2 radicals and CH_3 radicals in said plasma to subject the implant crust to the plasma for use in removal of the implant crust (methanol, CH_3OH—column 5, line 34; see also instant specification paragraph 28, which lists methanol as a process gas that will produce CH_2 or CH_3 radicals).

Fukuyama et al. additionally teaches that this plasma treatment is intended to remove an implant crust that is formed as an outmost layer of a photoresist pattern that is supported by a treatment object, said implant crust being formed responsive to exposure of the treatment object to an ion implant (the paragraph bridging columns 1 and 2 teaches that during the halogen plasma etch of the aluminum layer—part of the treatment object—halogens adhere on the surface of the resist and are implanted due to the bombardment of ions) that introduces an implanted dopant into the treatment object (the paragraph bridging columns 1 and 2 additionally teaches that halogen components adhere to the sidewall of the etched wiring pattern) as well as into the photoresist (see above), thereby producing said implant crust. Fukuyama et al. does not expressly teach the implant dose of the ion bombardment causing the unwanted halogen doping, but claim 1 does not specify a dose, and since the ion bombardment taught by Fukuyama et al. is high enough to cause halogen components to implant in the resist, it is deemed a "high dose."

Furthermore, the phrase "at least for use in removing an implant crust that is formed as an outermost layer of a photoresist pattern that is supported by a treatment object, said implant crust being formed responsive to exposure of the treatment object to a high dose ion implant which introduces an implanted dopant into the treatment object as well as into the photoresist, thereby producing said implant crust" is an intended use of the plasma reactor system that does not limit the features of the system. Even if Fukuyama et al. did not teach this intended use of their system, their system is capable of generating a plasma using a hydrocarbon gas in combination with

oxygen gas to subject an object to the plasma, said plasma being free of halogen, so claim 1 contains no structural limitation to distinguish the instant invention from the system taught by Fukuyama et al. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (see MPEP 2111.02).

Regarding claim 68, Fukuyama et al. teaches, in a plasma reactor system at least for use in removing an implant crust from a treatment object, a method comprising the steps of generating a halogen-free plasma (Fukuyama et al., claim 7) in a plasma chamber using a gas in combination with oxygen gas in a way which produces at least one of CH_2 radicals and CH_3 radicals in the plasma and which subjects the implant crust to the plasma for use in removal of the implant crust (methanol, CH_3OH—column 5, line 34; see also instant specification paragraph 28, which lists methanol as a process gas that will produce CH_2 or CH_3 radicals).

Fukuyama et al. additionally teaches that this plasma treatment is intended to remove an implant crust that is formed as an outmost layer of a photoresist pattern that is supported by a treatment object, said implant crust being formed responsive to exposure of the treatment object to an ion implant (the paragraph bridging columns 1 and 2 teaches that during the halogen plasma etch of the aluminum layer—part of the treatment object—halogens adhere on the surface of the resist and are implanted due to the bombardment of ions) that introduces an implanted dopant into the treatment

object (the paragraph bridging columns 1 and 2 additionally teaches that halogen components adhere to the sidewall of the etched wiring pattern) as well as into the photoresist (see above), thereby producing said implant crust. Fukuyama et al. does not expressly teach the implant dose of the ion bombardment causing the unwanted halogen doping, but claim 1 does not specify a dose, and since the ion bombardment taught by Fukuyama et al. is high enough to cause halogen components to implant in the resist, it is deemed a "high dose."

Furthermore, the phrase "at least for use in removing an implant crust that is formed as an outermost layer of a photoresist pattern that is supported by a treatment object, said implant crust being formed responsive to exposure of the treatment object to a high dose ion implant which introduces an implanted dopant into the treatment object as well as into the photoresist, thereby producing said implant crust" is an intended use of the plasma reactor system that does not limit the features of the system. Even if Fukuyama et al. did not teach this intended use of their system, their system is capable of generating a plasma using a hydrocarbon gas in combination with oxygen gas to subject an object to the plasma, said plasma being free of halogen, so claim 1 contains no structural limitation to distinguish the instant invention from the system taught by Fukuyama et al. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (see MPEP 2111.02).

Regarding claim 75, Fukuyama et al. teaches a plasma reactor system at least for use in removing a process residue from a treatment object, which process residue is formed on the treatment object, at least in part as a result of removing an ion-implanted photoresist from the treatment object, said ion-implanted photoresist crust being formed responsive to exposure of the treatment object to a high dose ion implant which introduces an implanted dopant into the treatment object as well as into the photoresist such that said residues at least contain an implant dopant species (column 1, lines 61-65; see argument above in the rejection of claim 1), said system comprising: a treatment chamber (**8** in Fig. 2) within which a plasma is generated using a hydrocarbon gas in combination with oxygen in a way which subjects the process residue including the implant dopant species to the plasma for use in removal of the process material crust (column 5, lines 30-64), said plasma being free of halogens, at least to an approximation (the treatment taught by Fukuyama et al. is designed to *remove* halogens from the treatment object, so halogens would not be present in the plasma; moreover claim 7 of Fukuyama et al. precludes the presence of halogens in the treatment plasma).

Furthermore, the phrase "at least for use in removing a process residue from a treatment object, which process residue is formed on the treatment object, at least in part, as a result of removing an ion-implanted photoresist from the treatment object, said ion-implanted photoresist crust being formed responsive to exposure of the treatment object to a high dose ion implant which introduces an implanted dopant into the treatment object as well as into the photoresist such that said residues at least

contain an implant dopant species" is an intended use of the plasma reactor system that does not limit the features of the system. Even if Fukuyama et al. did not teach this intended use of their system, their system is capable of generating a plasma using a hydrocarbon gas in combination with oxygen gas to subject an object to the plasma, said plasma being free of halogen, so claim 1 contains no structural limitation to distinguish the instant invention from the system taught by Fukuyama et al. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (see MPEP 2111.02).

Regarding claim 76, Fukuyama et al. teaches, in a plasma reactor system at least for use in removing a process residue from a treatment object, which process residue is formed on the treatment object, at least in part as a result of removing an ion-implanted photoresist from the treatment object, said ion said ion-implanted photoresist crust being formed responsive to exposure of the treatment object to a high dose ion implant which introduces an implanted dopant into the treatment object as well as into the photoresist such that said residues at least contain an implant dopant species (column 1, lines 61-65; see also argument regarding similar subject matter in the rejection of claim 1 above), a method comprising: generating a plasma in a treatment chamber using a hydrocarbon gas in combination with oxygen such that the plasma is halogen free (the treatment taught by Fukuyama et al. is designed to *remove* halogens from the treatment object, so halogens would not be present in the plasma; see also

claim 7 of Fukuyama et al.), at least to an approximation, in a way which subjects the process residue including the implant dopant species to the plasma for use in removal of the process material crust (column 5, lines 30-64).

Furthermore, the phrase "at least for use in removing a process residue from a treatment object, which process residue is formed on the treatment object, at least in part, as a result of removing an ion-implanted photoresist from the treatment object, said ion-implanted photoresist crust being formed responsive to exposure of the treatment object to a high dose ion implant which introduces an implanted dopant into the treatment object as well as into the photoresist such that said residues at least contain an implant dopant species" is an intended use of the plasma reactor system that does not limit the features of the system. Even if Fukuyama et al. did not teach this intended use of their system, their system is capable of generating a plasma using a hydrocarbon gas in combination with oxygen gas to subject an object to the plasma, said plasma being free of halogen, so claim 1 contains no structural limitation to distinguish the instant invention from the system taught by Fukuyama et al. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (see MPEP 2111.02).

Claims 1, 17, 19, 20, 34, and 36 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshihara et al. (U.S. 5,763,328).

Regarding claim 1, Yoshihara et al. teaches a plasma reactor system (Fig. 1) at least for use in removing a process material crust (photoresist, column 1, lines 51-60) from a treatment object, said system comprising a treatment chamber (**24** in Fig. 1) within which a plasma is generated using a hydrocarbon gas (methanol) in combination with oxygen gas (column 2, lines 28-42) in a way which subjects the process material crust to the plasma in a way which subjects the process material crust to the plasma for use in removal of the process material crust, said plasma being free of halogens, at least to an approximation (Yoshihara et al. claim 1—gas is *composed of* an oxygen gas and an alcohol gas, see MPEP 2111.03).

The phrase "at least for use in removing an implant crust that is formed as an outermost layer of a photoresist pattern that is supported by a treatment object, said implant crust being formed responsive to exposure of the treatment object to a high dose ion implant which introduces an implanted dopant into the treatment object as well as into the photoresist, thereby producing said implant crust" is an intended use of the plasma reactor system that does not limit the features of the system, and is therefore not being given patentable weight. The system taught by Yoshihara et al. is capable of generating a plasma using a hydrocarbon gas in combination with oxygen gas to subject an object to the plasma, said plasma being free of halogen, so claim 1 contains no structural limitation to distinguish the instant invention from the system taught by Yoshihara et al. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to

patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (see MPEP 2111.02).

Regarding claims 17 and 19, Yoshihara et al. teaches the system of claim 1, and further teaches that the treatment chamber is at a pressure selected in the range of approximately 0.5 to 15 Torr, and at a pressure of approximately 1 Torr (Table 1).

Regarding claim 20, Yoshihara et al. teaches, in a plasma reactor system at least for use in removing a process material crust from a treatment object, a method comprising the steps of generating a plasma in a chamber using a hydrocarbon gas in combination with oxygen gas (column 2, lines 27-42) such that the plasma is halogen free (claim 1—gas is *composed of* an oxygen gas and an alcohol gas, see MPEP 2111.03), at least to an approximation, in a way which subjects the process material crust to the plasma for use in removal of the process material crust (column 1, lines 37-43 and 52-60).

The phrase "at least for use in removing an implant crust that is formed as an outermost layer of a photoresist pattern that is supported by a treatment object, said implant crust being formed responsive to exposure of the treatment object to a high dose ion implant which introduces an implanted dopant into the treatment object as well as into the photoresist, thereby producing said implant crust" is an intended use of the plasma reactor system that does not limit the features of the system, and is therefore not being given patentable weight. The system taught by Yoshihara et al. is capable of generating a plasma using a hydrocarbon gas in combination with oxygen gas to subject an object to the plasma, said plasma being free of halogen, so claim 1 contains

no structural limitation to distinguish the instant invention from the system taught by Yoshihara et al. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (see MPEP 2111.02).

Regarding claims 34 and 36, Yoshihara et al. teaches the method of claim 20, and further teaches that the treatment chamber is at a pressure selected in the range of approximately 0.5 to 15 Torr, and at a pressure of approximately 1 Torr (Table 1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 10, 17-19, 29, and 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuyama et al. (U.S. 5,770,100).

Regarding claims 10 and 29, Fukuyama et al. teaches the system of claim 1 and the method of claim 20 (note 35 U.S.C. 102(b) rejection above), but does not expressly teach that the hydrocarbon gas is in a range of from approximately 15% to 85% of an overall mixture with the oxygen gas.

Regarding claims 17-19 and 34-36, Fukuyama et al. additionally does not teach that the treatment chamber is at a pressure selected in the range of approximately 0.5 to 15 Torr, 3 Torr, or 1 Torr.

However, it has been held that "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller* 105 USPQ233, 255 (CCPA 1955).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to use the system and method taught by Fukuyama et al. and optimize the plasma chemistry to arrive at a combination of oxygen and hydrocarbon gas such that the hydrocarbon gas is in a range of from approximately 15% to 85% of an overall mixture with the oxygen gas. It additionally would have been obvious to one or ordinary skill in the art to optimize the treatment chamber pressure to arrive at approximately 0.5 to 15 Torr, 3 Torr, or 1 Torr.

Claims 13, 14, 32, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuyama et al. (U.S. 5,770,100) in view of Wolf et al. (Silicon Processing for the VLSI Era, vol. 1, 2000).

Regarding claims 13 14, 32, and 33, Fukuyama et al. teaches the system of claim 1 and the method of claim 20 (note 35 U.S.C. 102(b) rejection above), but does not teach that an inductive coil induces power into the plasma at a power level of at least 200 W—further limited by claim 13—or approximately 3000 W, which is at least 500 W—further limited by claim 32, and in the range from approximately 500 W to 5000 W—further limited by claim 33.

Wolf et al. teaches that plasmas powered with inductive coils involves equipment that is simple to design, manufacture, and maintain compared to microwave-based plasma (pg. 708, section 14.8.3.3).

Furthermore, it has been held that "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller* 105 USPQ233, 255 (CCPA 1955).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the system taught by Fukuyama et al., by using an inductive coil to power the plasma, and optimize the power level to arrive at at least 200 W or approximately 3000 W. The motivation for doing so at the time of the invention would have been because such powering a plasma by inductive coil involves equipment that is simple to design, manufacture, and maintain compared to microwave-based plasmas, as expressly taught by Wolf et al.

Claims 18 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshihara et al. (U.S. 5,763,328).

Regarding claims 18 and 35, Yoshihara et al. teaches the system of claim 1 and the method of claim 20 (note 35 U.S.C. 102(b) rejection above), but does not teach that the treatment chamber is at a pressure of approximately 3 Torr.

However, Yoshihara et al. teaches that the treatment chamber is above 2 Torr, and further discloses that the aluminum in the treatment object did not corrode when ashing was performed at a pressure greater than 1.6 Torr. Furthermore, it has been held that "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller* 105 USPQ233, 255 (CCPA 1955).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to use the system of claim 1 or the method of claim 20, as taught by Yoshihara et al., and further set the pressure of the treatment chamber to approximately 3 Torr, since Yoshihara et al. teaches that it is advantageous to use pressures above 1.6 Torr in the ashing process.

Allowable Subject Matter

Claims 11, 12, 30, 31, 81, and 82 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Prior art does not teach or suggest, in combination with the other claimed subject material, a plasma generated using a hydrocarbon gas in combination with oxygen, said plasma being free of halogens, at least to an approximation, wherein the hydrocarbon is methane (CH_4).

Response to Arguments

Applicant's arguments filed 1/27/2006 have been considered but they are not fully persuasive.

Regarding the rejection of claims 1-9, 15, 16, 20-28, 67, 68, 75, and 76 over Fukuyama et al., Applicant argues that Fukuyama et al. does not teach the removal of an implant crust, as recited by amended claim 1 (last paragraph of p. 12 – p. 13). However, the examiner disagrees, as is detailed in the rejection of claim 1 above. Fukuyama et al. does teach ion bombardment of the photoresist, which results in the

implantation of dopants into the photoresist. In addition to preventing corrosion of the aluminum wiring, the plasma treatment taught by Fukuyama et al. removes "residual matter (resist component, etc.)"—column 7, first full paragraph. This photoresist having the implanted impurities is therefore an undesirable implant crust that the plasma treatment removes.

Moreover, as also detailed above in the rejection of claim 1, the intended use of the plasma system does not change the structural properties or capabilities of the plasma reactor system, as recited in claim 1 of the instant application. The plasma reactor system taught by Fukuyama et al. is capable of generating a plasma using a hydrocarbon gas and an oxygen gas without the presence of halogens. Therefore, the intended use of the system is irrelevant. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (see MPEP 2111.02).

Regarding the rejection of claims 2-4 and related claims over Fukuyama et al., Applicant argues that the examiner improperly refers to Applicant's own specification to support the rejection. However, the examiner merely uses Applicant's disclosure of fact to support an inherency argument. Fukuyama et al. discloses use of the hydrocarbon gas methanol, but does not expressly teach that this hydrocarbon gas produces low-molecular weight radicals. However, Applicant discloses in paragraph 28 of the specification that methanol produces low-molecular weight radicals when introduced

into a plasma. Since methanol used in a plasma produces low-molecular weight radicals for the Applicant, it must do so for Fukuyama et al., since the paragraph quoted by the examiner in the rejection merely discloses a list of hydrocarbon gases that yield this specific result when introduced into a plasma, and not any special feature of Applicant's invention. It is not necessary for Fukuyama et al. to teach that methanol produces low-molecular weight radicals in order for it to be a fact.

Regarding the rejection made over Yoshihara et al., Applicant essentially repeats the arguments made over the rejection over Fukuyama et al. The examiner reiterates in this context that the intended use of the plasma reactor apparatus does not receive patentable weight because it does not affect the features or capabilities of the apparatus. The plasma system disclosed by Yoshihara et al. produces the same plasma as claimed in claim 1, so could be used for the same purpose as recited in claim 1.

Regarding Applicant's arguments concerning the rejections made over Ho (U.S. 2002/0110992), the examiner finds these arguments persuasive, so the rejections are withdrawn. This action has been made non-final to give Applicant the opportunity to respond to the new rejections made as a result of the withdrawal of the rejections over Ho.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Heather A. Doty, whose telephone number is 571-272-8429. The examiner can normally be reached on M-F, 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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